PERIPHERAL DATA STORAGE SYSTEM WITH MULTI-STATE USER DISPLAY

[0001] This invention relates to peripheral data storage systems. More particularly, the present invention is directed to peripheral data storage systems with multi-state user display.

BACKGROUND OF THE INVENTION

[0002] External peripheral data storage systems such as external disk drives and card readers are standalone units that are commonly mounted to and communicate with a host computer, generally via an external cable such as a universal serial bus (USB) cable or Firewire™ cable.

[0003] It is desirable to provide users of peripheral data storage system with some form of display which notifies the users of the status of the peripheral data storage system and provides reassurance that the peripheral data storage system is operational. More recently, these peripheral data storage systems have become more complicated due to added functions and backup options. In today's competitive market, however, complex displays can add to the overall cost of the peripheral data storage system while also being confusing to the user.

[0004] Accordingly, what is needed is a more cost-effective method for the notifying the users of the status of the peripheral data storage system.

SUMMARY OF THE INVENTION

[0005] This invention can be regarded as a method of displaying states of a peripheral data storage system comprising a data storage device, a data storage system controller, a user-actuated signaling subsystem, a user display subsystem adapted to display the states, and a peripheral data storage controller host interface adapted for communication with a host system. The method includes determining a state of the peripheral data storage system; displaying a first display state via the user display subsystem if the peripheral data storage system is in an idle state; and displaying a second display state via the user display subsystem if the peripheral data storage system is in a state corresponding to receiving a signal from the user-actuated signaling subsystem.

[0006] The method further includes displaying a third display state via the user display subsystem if the peripheral data storage system is in a dynamically active state; and displaying a fourth display state via the user display subsystem if the peripheral data storage system is in an off state.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] **FIG. 1** illustrates an exemplary peripheral data storage system in which the present invention may be practiced.

[0008] **FIG. 2A-B** are flow charts illustrating the method of the present invention used in the exemplary peripheral data storage system shown in FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

[0009] With reference to **FIG. 1**, an exemplary peripheral data storage system 10 is shown in which the method of the present invention for displaying states of a peripheral data storage system 10 may be practiced. As shown in FIG. 1, the peripheral data storage system 10 such as an external disk drive system, comprises a data storage device 40, such as a disk drive, a data storage system controller 20, a user-actuated signaling subsystem 50, a user display subsystem 51 adapted to display the states of the peripheral data storage system 10, and peripheral data storage controller host interface 21 adapted for communication with the host system 30 via the communication medium 31, such as a universal serial bus (USB) cable or a Firewire™ cable. Suitably, the user-actuated signaling subsystem 50 comprises electro-mechanical switches 52, 53 and 54. Suitably, the data storage system controller 20 is a bridge controller and the peripheral data storage controller host interface 21 is a bridge controller host interface. During the operations of the data storage device 40, the peripheral system controller 20 transmits command 63 to the power switch 60 for providing the data storage device 40 with a DC operating current 62 inputted via line 61 from an external power source (not shown). Suitably, the user display subsystem 51comprises an electro-mechanical switch 55, such as a power button, for turning power on and off to the peripheral data storage system 10.

[00010] **FIG. 2A-B** are flow charts illustrating the method of the present invention for displaying states of the peripheral data storage system 10 shown in FIG. 1. As shown in **FIG. 2A**, the process begins in block 200 in which a state of the peripheral data storage system 10 is determined. Next, in block 202, a first display state is displayed via the user display subsystem 51 if the peripheral data storage system 10 is in an idle state. Next, in block 204 a second display state is displayed via the user display subsystem 51 if the peripheral data storage system 10 is in a state corresponding to receiving a signal from the user-actuated signaling subsystem, as described below and in greater detail in conjunction with FIG. 2B. Next, in block 206, a third display state is displayed via the user display subsystem 51 if the peripheral data storage system 10 is in a dynamically active state, such as when the data storage device 40 is being addressed to perform a data

transfer command. Suitably, for a data storage device 40 conforming to the Advanced Technology Attachment (ATA) standard may provide a Drive Active Slave Present (DASP) signal, defined in the ATA standard, corresponding to the above mentioned dynamically active state. Suitably, if the peripheral data storage system 10 employs a data storage devices 40 conforming to the Serial ATA (SATA), a logic function on the data storage system controller 20 can provide a logic function signal corresponding to a command being sent to the data storage device 40. Next, in block 208, a fourth display state is displayed via the user display subsystem 51 if the peripheral data storage system 10 is in an off state, such as an off state corresponding to an off state of the data storage device 40. Suitably the user display subsystem 51 comprises a user-visible display device 56 adapted to display the first, second and third display states in the form of a first, a second and a third displaying of emitted light. Suitably, the first displaying of emitted light comprises a continuous displaying of emitted light, the second displaying of emitted light is a first flashing pattern, the third displaying of emitted light is a second flashing pattern, such as an aperiodic flashing pattern corresponding to the receipt of the above described DASP or logic function signals, and the fourth display state comprises an absence of emitted light. The user-visible display device 56 may also suitably comprises an alpha-numeric display adapted to display the first, second, and third display states in the form of a first, a second and a third displaying of alpha-numeric characters. Then flow the proceeds to block 210 where the overall process ends.

[00011] **FIG. 2B**, in conjunction with FIG. 1, further describes the process of displaying a second display state in block 204 of **FIG. 2A**. As shown in FIG. 2B, the process begins in block 210 in which the received signal is communicated to the host system 30 via the host interface 21. The received signal may correspond to a first user-inputted request for a mounting or dismounting of the peripheral data storage system 10. Suitably, the user-actuated signaling subsystem 50 comprises a first electro-mechanical switch 52 adapted to receive the first user-inputted request and the user-actuated signaling subsystem 50 is adapted to generate the received signal 52a based on the first user-inputted request. The received signal may also correspond to a second user-inputted request for performing a task corresponding to a host-scheduled backup operation for a scheduled backing up of data to

the peripheral data storage system 10. Suitably, the user-actuated signaling subsystem 50 comprises a second electro-mechanical switch 53 adapted to receive the second user-inputted request and the user-actuated signaling subsystem 50 is adapted to generate the received signal 53a based on the second user-inputted request. The received signal may also correspond to a third user-inputted request for performing an on-demand backing up of pre-selected data to the peripheral data storage system 10. Suitably, the user-actuated signaling subsystem 50 comprises a third electro-mechanical switch 54 adapted to receive the third user-inputted request and the user-actuated signaling subsystem 50 is adapted to generate the received signal 54a based on the third user-inputted request.

[00012] Next, in block 212, an acknowledgement signal is received from the host system 30 in response to the communicating of block 210. Next, in block 214, the user display subsystem 51 is switched from the first display state to the second display state in response to the received acknowledgement signal. Next, in block 216, a first signal is received from the host system 30. Next, in block 218, the user display subsystem 51 is switched from the second display state to the third display state in response to the received first signal. Next, in block 220, a second signal is received from the host system 30. Next, in block 222, the user display subsystem 51 is switched from the third display state to either the first display state or the fourth display state in response to the received second signal. For example, if the signal received in block 210 corresponded to a second user-inputted request for performing a task of enabling of a host-scheduled backup operation, then in block 222 the user display subsystem 51 is switched from the third display state to the first display state which comprises displaying a continuous displaying of emitted light on the user-visible display device 56. If the signal received in block 210 corresponded to a second user-inputted request for performing a task of disabling of a host-scheduled backup operation, then in block 222 the user display subsystem 51 is switched from the third display state to the fourth display state which comprises an absence of emitted light on the user-visible display device 56. The flow then proceeds to block 224 for returning to block 204 of FIG. 2A.

[00013] One advantage of the foregoing feature of the present invention over the prior art is that by using a single multi-state user-visible display device having four display states, the need for complex displays that can add to the overall cost of the peripheral data storage system while also being confusing to the user can be reduced.

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[00014] It should be noted that the various features of the foregoing embodiment were discussed separately for clarity of description only and they can be incorporated in whole or in part into a single embodiment of the invention having all or some of these features.